PROFILE OF

ARGONNE NATIONAL LABORATORY - WEST

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FOREWORD

Site profiles summarize the effectiveness of Department of Energy (DOE) line management in implementing the Secretary of Energy's guiding principles of safety management; the effectiveness of DOE environment, safety, and health (ES&H), and safeguards and security (S&S) programs; and key site characteristics such as organization, contract reform, significant issues, key facilities, performance measures, and site initiatives and activities.

Profiles are a valuable planning tool for the DOE Office of Oversight in focusing appraisal activities, allocating staff resources, and analyzing Departmental trends. Profiles also serve as an authoritative reference for other stakeholders. They assist in answering critical questions about the state of the DOE complex: How effective are site management systems/programs? What trends require immediate attention? How safe are site workers and the public? And is the environment being adequately protected and restored? The analysis of the performance data contained in the site profiles provides baseline information regarding safety or security program weaknesses, thus allowing timely intervention by Department management. This information is reported in a format designed to highlight essential missions, performance, significant issues, and operational data at a management level.

The Office of Oversight maintains site profiles on 20 major DOE sites. Each profile is normally updated semiannually through a rigorous process led by the Oversight Offices of Planning and Analysis and EH Residents, with significant contributions from the Offices of Security Evaluations and ES&H Evaluations. Line management plays a key role by verifying that the information is accurate, current, significant, clear, and balanced.

Site profiles are developed using an institutionalized process of collecting data from multiple sources, and then collating, synthesizing, and analyzing this information to develop an accurate evaluation of ES&H and S&S performance at the site. The data that forms the basis of a site profile comes from sources both internal and external to the Department of Energy. Site profiles will evolve in content and form as necessary to meet their intended objective--to have available current, comprehensive, summaries of ES&H and S&S information pertaining to key DOE sites.

The site profile reflects the Office of Oversight's analysis of the best available data, and was verified for factual accuracy by line management prior to dissemination. Since profiles describe site conditions at the time of distribution, they may not reflect recent changes. If real time confirmation of information is required, the reader should query line management directly.

PROFILE OF

ARGONNE NATIONAL LABORATORY WEST (ANL-W)

OVERVIEW

SITE CHARACTERISTICS

Site characteristics include information on site size and location, mission, organizations, contractual status, and major initiatives and activities.

Additional information on site characteristics is provided in Section 1.0, starting on page 1.

Date Established: 1949

Present Mission:

ANL-W continues its primary mission of developing environmental remediation technologies.

Development of environmental remediation technologies. Activities include decontaminating and defueling of Experimental Breeder Reactor-II (EBR-II), developing techniques for treating EBR-II fuel for long-term storage, preparing sodium waste for disposal, and characterizing solid waste for eventual shipment to the Waste Isolation Pilot Plant (WIPP).

Size: 810 acres; 84 acres are inside the property protection area.

Employees: Six Department of Energy (DOE) and 753 contractor personnel (as of May 1996).

Annual Budget: The Argonne National Laboratory - West (ANL-W) budget is $82 million for fiscal year (FY) 1996.

Cognizant Secretarial Officer: Director, Office of Nuclear Energy, Science & Technology (NE); the principal NE office is the Office of Facilities (NE-40).

Responsible Operations/Area Office: DOE Chicago Operations Office (CH)/Argonne Group - West (ARG-W).

Integrating Contractor: University of Chicago.

Subcontractors: The currently active subcontractors are Ugaki (general contractor), and Hughes Roofing.

Fissile Material: About 90 kg of Pu-239, 10 kg of U-235, 7 metric tons of heavy metal, a large amount of spent fuel (about 73,800 fuel

assemblies, elements, rods, and plates), and fresh reactor fuel for EBR-II.

Significant Commitments to Stakeholders:

ANL-W is performing a Remedial Investigation/ Feasibility Study according to a Federal Facility Agreement with the Environmental Protection Agency.

- A Consent Order from the State of Idaho resulted in an agreement with Lockheed Martin Idaho Technologies (LMIT) for ANL-W to process sodium-potassium reactor coolant that was stored in an Idaho National Engineering Laboratory (INEL) bunker. The project is complete.

- An agreement with the State of Idaho for the processing of sodium wastes from FERMI I reactor coolant operations mandated in the Site Treatment Plan, which is required by the Federal Facilities Compliance Act.

- ANL-W is in the process of performing a Remedial Investigation/ Feasibility Study in accordance with a Federal Facility Agreement with Environmental Protection Agency Region 10 and the State of Idaho.

Unions: Oil, Chemical, and Atomic Workers.

One union is represented at ANL-W.

Major Site Activities/Initiatives:

The Fuel Manufacturing Facility (FMF) and the Zero Power Physics Reactor (ZPPR) vaults are planned for long-term storage of plutonium and plutonium-bearing materials.

The Radioactive Scrap Waste Facility (RSWF) is being used for interim storage of solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition. The Radioactive Liquid Waste Treatment Facility (RLWTF) processes low-level radioactive liquid for disposal at the INEL Radioactive Waste Management Complex (RWMC).

EBR II decontamination, decommissioning, and defueling are under way.

As a result of an environmental assessment conducted by CH and ARG in May 1996, the Fuel Conditioning Facility (FCF) was identified to be an activity with non-significant environmental impacts. Based upon that Finding of No Significant Impact, electrometallurgical treatment of EBR II spent nuclear fuel began in June 1996.

ANL-W is constructing a Sodium Processing Facility to process sodium reactor coolant from the FERMI I and EBR reactors.

ANL-W is performing waste characterization at the Hot Fuel Examination Facility (HFEF) to allow for shipment of waste to WIPP when it becomes available.

ENVIRONMENT, SAFETY, AND HEALTH (ES&H) ISSUES

A sitewide issue is an issue present at multiple facilities or within ES&H programs that impact sitewide operations.

Additional information on sitewide issues is provided in Section 3.0, starting on page 6.

Sitewide Issue 1: There are potential hazards associated with EBR-II shutdown and decommissioning to place the facility in a safe and stable condition. The goal is to place EBR-II in an industrial and radiologically safe shutdown condition by the end of FY 1998.

Sitewide Issue 2: Six vulnerabilities identified by the Plutonium Working Group are related to the packaging of scrap and/or residue materials shipped to ANL-W from other DOE sites, and to the lack of up-to-date safety basis for two facilities.

KEY FACILITIES

A key facility is a facility or building that is significant from an environment, safety, and health perspective. At some sites, a key facility can be a group of facilities with similar missions, activities, hazards, or vulnerabilities.

Additional information on key facilities is provided in Section 4.0, starting on page 7.

There are ten key facilities at ANL-W.

Buildings 765 and 709, Fuel Conditioning Facility (FCF) - An electrometallurgical processing facility where metallic fuels from the liquid-metal-cooled reactor EBR-II are conditioned for long term storage.

Building 752, Analytical Laboratory, North Wings (A & B Wings) - Chemical, radiochemical, and physical measurements in support of the ANL-W nuclear and environmental programs.

Experimental Breeder Reactor-II - Uranium-plutonium-fueled, liquid-metal pool-type Category A breeder reactor with a thermal power rating of 62.5 MW with a secondary sodium loop and a steam plant that produces 19 MW of electrical power through a conventional turbine generator. The reactor will be completely defueled by December 1996.

Building 785, Hot Fuel Examination Facility (HFEF) - Remote handling, packaging, examination and other operations on highly irradiated fuels, materials, and wastes in support of site activities.

Transient Reactor Test Facility (TREAT) - Zircaloy-clad, graphite-moderated Category B reactor designed primarily for operation in the transient or pulse mode and for destructive testing of prototypic fast reactor highly enriched ceramic-type fuel. TREAT is shut down.

Neutron Radiography Reactor (NRAD) - Heterogeneous, water-moderated, solid-fueled, tank-type reactor operating at a steady state power of 250 kW.

Zero Power Physics Reactor (ZPPR) - Category B reactor contained in a split-table-type critical facility and currently in shutdown status. The ZPPR vault provides storage for Category I quantities of special nuclear materials.

Fuel Manufacturing Facility (FMF) - Houses binary (uranium and zirconium) fuel manufacturing equipment; provides vault storage for Category I quantities of special nuclear material, including plutonium.

Building 798, Radioactive Liquid Waste Treatment Facility (RLWTF) - Processes low-level radioactive liquid waste from EBR-II, FCF, HFEF, TREAT, ZPPR, and support facilities.

Radioactive Scrap Waste Facility (RSWF) - Interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition.

SITE PERFORMANCE

Additional information on site performance is provided in Section 2.0, starting on page 3.

Site performance is based on an analysis of available data on facilities and programs. This includes information from Office of Oversight activities augmented by valid and relevant external and internal sources. Site performance is evaluated in terms of three of the guiding principles for safety management.

Overall Safety Management Program - NOT EVALUATED

Principle #1 - Line Management Responsibility - NOT EVALUATED

CH oversight of ANL-W activities is in transition. The CH Environment, Safety and Health Division now serves as a resource to the ARG-W ES&H organization, which is now responsible for conducting ES&H program reviews of ANL-W activities. As a result of deficiencies in the ANL-W quality assurance program and internal oversight of this program, programmatic changes were instituted making Division Directors responsible for proper implementation of quality assurance requirements, establishing a more focused self-

assessment group, and updating and issuing sitewide procedures. In May 1995, CH renegotiated its contract with the University of Chicago, which contains a performance fee based on research and operations (including ES&H) performance.

Principle #2 - Comprehensive Requirements - NOT EVALUATED

Programs are generally documented and implemented. Notable examples include industrial hygiene, industrial safety, fire protection, the EBR-II nuclear safety program, and construction management.

Principle #3 - Competence of Personnel - NOT EVALUATED

In the evaluation by ARG of ANL performance under its modified contract (See Performance Measures, below), the area of Institutional Management Performance was rated Excellent. This area includes staffing and organization (also rated Excellent).

PERFORMANCE MEASURES

Performance measures are quantitative and qualitative indications of ES&H performance taken from such sources as the Occurrence Reporting and Processing System the Computerized Accident/ Incident Reporting System, as well as contractually mandated indicators of performance.

Additional information on performance measures is provided in Section 5.0, starting on page 12.

A modification to Contract No. W-31-109-ENG-38 (August 1, 1995) established a system utilizing performance measures and criteria in 17 categories to evaluate ANL performance. Specific goals and success indicators have been established for ES&H and safeguards and security programs to evaluate ANL performance of these programs. An evaluation by ARG of ANL using these performance measurements and criteria has been completed, but the results will not be final until February 1997. Also, a new modification to the contract has been developed that includes new performance measures and criteria for FY 1997 ANL performance. The latest appraisal was conducted in FY 1995 and contains the combined results of ANL-E and ANL-W. Where applicable, ratings were weighted between ANL-W and ANL-E and between the size and complexity of various programs or functions within a single rated category. The ratings for this appraisal are as follows.

- Institutional Management Performance — Excellent
- Programmatic Performance — Excellent
- Operations Support Performance — Excellent
- Administrative Management — Excellent

Figure 1. ANL-W Site Map

SITE PROFILE -- ARGONNE NATIONAL LABORATORY - WEST

1.0 SITE CHARACTERISTICS

1.1 SITE LOCATION AND SIZE

Argonne National Laboratory-West (ANL-W) is located in Idaho at the Idaho National Engineering Laboratory (INEL). ANL-W is a part of the main Argonne National Laboratory, which is located near Chicago, Illinois. ANL-W occupies about 810 acres, of which only 84 acres are inside the property protection area; the INEL site occupies 890 square miles. It is approximately 31 miles from the nearest ANL-W site boundary to Idaho Falls, Idaho. Other smaller communities, such as Arco, Blackfoot, Dubois, and Howe, are also adjacent to the INEL site. The nearest incorporated town, Atomic City (population 8), is one half mile from the southern boundary of the INEL site and approximately 18 miles southwest of the ANL-W site. Most of the INEL site is unpopulated, semiarid desert rangeland and sagebrush over volcanic deposits.

1.2 SITE MISSION

ANL-W initially constituted the testing and development arm of Argonne for advanced reactors, with facilities designed to proof-test liquid metal reactor technology and associated fuel cycles. The research included reactor safety, fuels and materials, fuel manufacturing, metal fuel processing, fuel cycle, related waste management, and actinide recycling.

The ANL-W mission has recently changed due to the cancellation of the Integral Fast Reactor (IFR) program and shutdown of the Experimental Breeder Reactor II (EBR-II). The new mission focuses on developing environmental remediation technologies. ANL-W has five reactors, fuel examination facilities, analytical laboratories, radioactive waste treatment facilities, and many support buildings. The only reactor currently active is a small reactor used for radiographic examination of experiments, waste containers, and spent nuclear fuel. Some of the activities include decontaminating and defueling EBR-II, developing techniques for processing EBR-II fuel for long-term storage, treating sodium waste for disposal, and characterizing solid waste for shipment to Waste Isolation Pilot Plant (WIPP).

1.3 SITE ORGANIZATIONS AND CONTRACT STATUS

Site Organizations

Contractor activities at ANL-W are managed by DOE's Argonne Group-West (ARG-W) under the direction of the Department of Energy (DOE) Chicago Operations Office (CH). ANL-W is operated by the University of Chicago, and it is a part of the main Argonne National Laboratory.

Finance Issues

Contract Reform and Status

In May 1995, the laboratory operating contract with the University of Chicago was renegotiated. The new contract includes a performance fee based on performance of research and operations, including ES&H performance. Performance objectives and supporting metrics are being developed to administer the contract and performance fee. The new contract is considered a model for non-profit organizations.

Budget Issues

The budget for Argonne National Laboratory is a combination of ANL-E and ANL-W; many of the activities are not broken out between sites. For example, environment, safety, and health (ES&H) costs fund the entire program and are

not separated by site. The total fiscal year (FY) 1997 budget for ANL-W is $82 million, of which $80.7 million is from the Office of Nuclear Energy, Science and Technology (NE); the remaining $1.3 million is from the office of Environmental Management (EM) for waste characterization. Other facilities are funded as follows: EBR-II ($18.2M), Sodium Process Facility ($6.3M), Fuel Manufacturing Facility ($.5M), Hot Fuel Examination Facility ($13.0M), Fuel Conditioning Facility/Analytical Lab ($25.2M), and Transient Reactor Test/ Zero Power Plutonium Reactor ($.2M).

1.4 MAJOR SITE INITIATIVES/ACTIVITIES

Spent Fuel Storage and Management

ANL-W is using the Fuel Conditioning Facility (FCF) for electrometallurgical treatment of EBR-II fuels. The treatment process removes the uranium from the spent fuel; the transuranic elements and fission products remain in the salt mixture, and the sodium chemically combines with the salt mixture to form sodium chloride. The recovered uranium will be blended to a low enriched uranium product and placed in storage. The transuranic elements and fission products are removed from the salt mixture, processed through a zeolite ion exchanger, and fabricated into a ceramic waste form for storage. The salt mixture will be disposed of as low-level radioactive waste.

The Fuel Manufacturing Facility (FMF) and the Zero Power Physics Reactor (ZPPR) vaults are planned for long-term storage of uranium, plutonium, and plutonium-bearing materials at ANL-W.

Waste Management

The Radioactive Scrap Waste Facility (RSWF) is being used for interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition. The Radioactive Liquid Waste Treatment Facility (RLWTF) processes low-level radioactive liquid for disposal at the INEL Radioactive Waste Management Complex (RWMC). Radioactive mixed waste is managed at the Fermi Sodium Storage building (Building 703) and at the Radioactive Sodium Storage Facility (Building 797).

Decontamination and Decommissioning

Defueling of EBR-II is under way.

Programmatic Activities

The FCF was formerly called the Fuel Cycle Facility, but was renamed the Fuel Conditioning Facility after the March 1994 decision to shut down and decommission EBR-II. ARG-W completed an environmental assessment to allow FCF operation; it is currently operating.

ANL-W is constructing a Sodium Processing Facility to process sodium reactor coolant from the FERMI I and EBR reactors. The facility will process the sodium coolant to a sodium carbonate to allow for land disposal.

ANL-W is performing waste characterization at the Hot Fuel Examination Facility (HFEF) to allow for shipment of waste to WIPP when it becomes available.

WIPP gas generation experiments are being conducted in the Blanket Storage Room inside the ZPPR Reactor Cell.

The Plasma Health Process Bench Scale Demonstration is to be conducted in the Transient Reactor Test Facility (TREAT) Reactor Building High Bay Area. Construction for this demonstration project is nearing completion.
Environmental restoration activities are proceeding in Waste Area Group (WAG) 9.

The treatment of EBR-I sodium-potassium (NaK) coolant is being conducted at the Sodium Components Maintenance Shop.

Special Interest Items

Local Interest Items

ANL-W is conducting a research and demonstration project for electrometallurgical treatment of EBR-II spent nuclear fuel at the FCF. DOE delayed project start-up to respond to stakeholder concerns, resulting in preparation of a new environmental assessment. Following a Finding of No Significant Impact (FONSI), operation was started in June 1996. The process removes uranium and concentrates the fission products to simplify waste disposal.

Congressional Interest Items

No long term issues are the focus of congressional concern or oversight at this time.

2.0 SITE PERFORMANCE

2.1 CONCEPTUAL BASIS FOR EVALUATION

The essential characteristic of successful programs and projects is the recognition and understanding of the need for an effective ES&H management system that ensures adequate control over all aspects of the program or project. In 1994, the Secretary of Energy established the principles and criteria that the Department deemed necessary for an effective safety management program. These principles include:

- Principle #1: Line managers are responsible and accountable for safety.
- Principle #2: Comprehensive requirements exist and are appropriate.
- Principle #3: Competence is commensurate with responsibilities.

2.2 SAFETY MANAGEMENT PROGRAM IMPLEMENTATION OF THE GUIDING PRINCIPLES

This interim evaluation was developed using information provided to the Office of Oversight by ARG-W. This information consists of a *Summary Appraisal Report of Argonne National Laboratory for Fiscal Year 1995* and data on injuries, illnesses, and radiological exposures.

The absence of an independent oversight evaluation at ANL-W suggests that the information presented should not necessarily be considered representative of overall ES&H performance across ANL-W, but rather limited to an indication of the ES&H performance of the program and/or facility identified. Where insufficient information was available to make a comprehensive assessment of either the implementation of a guiding principle (Section 2.2) or an implementing program (Section 2.3), a limited evaluation or specific example of performance based on the best available information is provided.

Principle #1 - Line Management Responsibility for Safety

CH oversight of ANL-W activities is in transition. The CH ES&H Division was responsible for conducting periodic appraisals of ANL-W. That responsibility has now been assigned to ARG-W, with technical support being provided by former CH ES&H safety professionals.

Improvement is needed in the implementation of the quality assurance program. Recent DOE reviews have identified failures to adhere to approved project quality assurance plans; these shortcomings were not recognized by the ANL-W internal assessment program, (see Facility Safety Program, Section 2.3). As a result a number of programmatic changes were instituted including: (1) making Division Directors responsible for proper implementation of quality assurance requirements, (2) establishing a more focused self-assessment group to provide independent and

continuing appraisals of quality assurance implementation, and (3) updating and issuing applicable sitewide procedures.

In May 1995, the laboratory renegotiated its contract with the University of Chicago. The contract contains a performance fee based on research and operations (which includes ES&H). DOE considers the new contract to be a model for non-profit organizations. Performance objectives and supporting performance measures have been developed to support administration of the contract. Performance measurement information using this new contract structure will not be generated until the end of fiscal year 1996.

Principle #2 - Comprehensive Requirements

Programs are generally documented and implemented. Notable examples include industrial hygiene, industrial safety, fire protection, radiation safety, the EBR-II nuclear safety program, and construction management.

Further program development and implementation are necessary in the quality assurance program.

Principle #3 - Competence Commensurate with Responsibilities

In the evaluation by ARG of ANL performance under its modified contract (see Performance Measures, Section 5.0), the area of Institutional Management Performance was rated Excellent. This area includes staffing and organization (also rated Excellent).

2.3 IMPLEMENTING PROGRAMS

Environmental Protection Program

ANL made progress on the accelerated comprehensive Remedial Investigation (RI) for ANL-W inactive waste sites. The RI process has been accelerated by one year from the Federal Facility Agreement enforceable milestone. However, the management of funds needs improvement. ANL-W has experienced some difficulty in submitting RI documents to DOE with enough lead time to allow adequate DOE review before submittal to regulators.

ANL-W upgraded the RSWF; the facility is now a safer, more effective operation. Management of mixed wastes improved with the dedication of additional staff to waste packaging, transport, and documentation. The amount of mixed waste stored on site decreased, and carryover funds were reduced.

ANL-W combined its environmental restoration, waste management, and environmental monitoring functions under one manager. Progress has been demonstrated in permitting activities, waste container management and shipment, and waste facility upgrades. A review of small-quantity hazardous and mixed waste accumulation areas by ARG-W resulted in eight findings concerning small waste container management.

To address the problems of small-quantity waste accumulation area management, ANL-W has assigned Environmental Compliance Representatives (ECRs) to all ANL-W facilities. The ECRs are independent in that they report to the Environment and Waste Manager, and not to facility managers. Implementation of the ANL-W Waste Handling Manual will formalize and standardize the process and will address deficiencies associated with moving radioactive and mixed waste to offsite storage and disposal locations in a timely manner.

Efforts have been commendable in preparing the Federal Facility Compliance Agreement Site Treatment Plan for mixed wastes and the Resource Conservation and Recovery Act permit applications for facilities to store mixed waste.

Nuclear Safety Program

In support of the primary ANL-W mission of defueling EBR-II and placing it in an industrially and radiologically safe shutdown condition, the goal of removing 170 subassemblies was met (and exceeded). Transition of the EBR-II organization to better support defueling operations has been accomplished with minimal impact. Reportable occurrences have decreased from 16 in fiscal year 1994 to 3 in fiscal year 1995.

Worker Safety and Health Program

The startup reviews for FCF indicated no findings or weaknesses in the overall industrial hygiene program. Improvement can be achieved by facility managers recognizing introduction of new hazards into the workplace and ensuring the involvement of site industrial hygiene professionals.

The industrial safety program demonstrated progress through increased involvement of industrial safety professionals as part of the work control process and the initiation of facility walkthroughs by line management. There was significant improvement in the number of reportable accidents and the number of lost workdays at ANL-W in 1995.

Maintenance of fire protection equipment is excellent. Response of ANL-W personnel to the large range fire of August 16, 1995, was exceptional. Progress is continuing on site-wide fire alarm upgrades, and fire alarms are now monitored at the ANL-W security central alarm centers.

Facility Safety Program

In 1995, two facility upgrade programs were ongoing—the FCF modifications program and the Analytical Laboratory upgrades program. A DOE line management readiness evaluation of FCF indicated that in spite of a satisfactory Project Quality Assurance Plan, there were instances in which the plan had not been followed, especially in the areas of installation and testing. A DOE review of the Analytical Laboratory upgrades program indicated that the project team deferred implementation of the Project Quality Assurance Plan in favor of the construction contractor's plan. However, there was not full compliance with this latter plan. In neither instance did the ANL-W project teams or the internal independent quality assurance assessment function identify these discrepancies and take corrective action.

Construction management practices improved through performance of the EBR-II plant closure project, achievement of operation readiness of FCF, and completion of the Analytical Laboratory Upgrades program. Use of a "project approach" has greatly improved performance in meeting cost and schedule targets.

ANL-W continues to make good progress on incorporating all DOE order requirements for emergency management. ANL-W's participation in the Advanced Test Reactor emergency exercise was noted as being excellent. ANL-W supported evacuation and response to the large range fire on August 16, 1995.

2.4 SAFEGUARDS AND SECURITY PROGRAMS

Appropriate safeguards and security policies and goals have been established, responsibilities and authorities for safeguards and security programs are generally understood, and management systems are responsive to safeguards and security management requirements. However, managers' ability to assume responsibility and to be held accountable for safeguards and security performance could be improved by giving more attention to the assessment systems, which at this time do not accurately portray program status. Overall performance in this area indicates that managers understand and accept their safeguards and security responsibilities and are

held accountable for safeguards and security performance.

Comprehensive safeguards and security exist, are appropriate to the ANL-W program, and are adequately implemented. The robust construction of the special nuclear material (SNM) storage facilities, the stringent access controls at these facilities, the effective interior alarm systems within the facilities, and the effective response exhibited by the protective force provide significant protection elements against theft or diversion of SNM at ANL-W. Deficiencies in implementation and performance monitoring of some programs call into question the actual level of system effectiveness. Weaknesses in physical security systems, neither identified by performance monitoring processes nor considered in the vulnerability and risk analysis process, do not support confidence in that system component. The CH and ANL-W assessment programs are not sufficiently effective to ensure confidence in the long-term ability to sustain adequate protection levels.

Overall, staffing levels and qualifications are appropriate for the current ANL-W mission. Required training programs are in place and supported by safeguards and security management.

3.0 SITEWIDE ES&H ISSUES

3.1 ISSUE DESCRIPTIONS

Sitewide Issue 1: Impacts of Defueling EBR-II and Workforce Downsizing

Cancellation of the IFR has resulted in the shutdown of EBR-II and the eventual downsizing of the workforce at ANL-W. The size of the workforce will remain stable while EBR-II undergoes defueling, but reductions will take place upon completion. Potential hazards are associated with the shutdown and decommissioning of EBR-II in order to place the facility in a safe and stable condition (e.g., loss of argon cooling, fuel handling accidents, sodium-water reactions, and malfunctioning equipment).

On March 15, 1994, the Secretary of Energy convened a working group to study how best to use the capabilities of ANL-W to advance technology in nuclear safety, waste management, nonproliferation, and other areas of national priority. The Administration found that the actinide recycle program does not support its nonproliferation policy, and as a result terminated the IFR program.

Sitewide Issue 2: Plutonium Vulnerabilities

The purpose of the plutonium vulnerability assessment was to ensure that responsible managers were cognizant of the ES&H and nonproliferation concerns associated with management and cleanup of the wide variety of forms of plutonium throughout the DOE complex. The Plutonium Working Group identified six plutonium vulnerabilities during their assessment at ANL-W:

1. Plutonium metal at ZPPR is improperly packaged. Hydrogen buildup, oxidation, and expansion could rupture the package and contaminate workers.

2. Plutonium oxide at ZPPR is improperly packaged. Pressurization could cause rupture the can and contaminate workers.

3. The MK III sodium test loops in TREAT represent a potential hazard to workers and the environment because their seals have not been inspected in approximately five years.

4. Questionable packaging of plutonium metals and oxides at the FMF could lead to expansion or pressurization of the can until it breached, contaminating the facility and/or personnel.

5. The ANL-W planned disposition of 1 to 3kg of plutonium oxide fines may not represent the safest approach. These oxides may be generated during inspection and repackaging of cans of metal and alloys stored at the ZPPR and FMF. The site's chosen disposal option may be the easiest, but not the most technically sound.

6. Both the FMF and ZPPR vaults are planned for long-term storage of plutonium and plutonium-bearing materials. However, DOE Headquarters rejected the implementation plan for upgrading the FMF and ZPPR vaults' safety documentation. Under the new requirement of DOE Order 5480.23, both vaults would be classified as Hazard Category II, but the documentation currently reflects Hazard Category III; in the case of ZPPR, the only documentation is a 1980 safety assessment document, which contains no independent analysis of the vaults. The safety analysis for the FMF vault was approved by DOE in August 1986.

ANL-W has prepared and submitted to the Office of Nuclear Energy (NE-2) a corrective action plan to address the vulnerabilities identified by the Plutonium Working Group. Corrective actions identified in the plan are under way.

3.2 SITEWIDE ISSUE STATUS

Table 1 characterizes sitewide issues in terms of an issue statement, primary concerns, site activities, and a progress evaluation.

4.0 KEY FACILITIES

4.1 FACILITY MISSION

Buildings 765 and 709, Fuel Conditioning Facility (FCF)

The FCF is a electrometallurgical processing facility where metallic fuels from the liquid-metal-cooled reactor EBR-II are conditioned for long term storage. The process includes: (1) fuel element segmentation through a chopping process, (2) fuel electro-refinement to remove rare earths, (3) consolidation of fuel in a cathode processor, and (4) processing with a salt stripper to remove rare earths from salt. These processes take place in a shielded, inert-atmosphere hot cell and include high-temperature molten metal, high-electrical-energy sources, and highly radioactive material.

The FCF began operating in 1965 and was briefly renamed the Hot Fuel Examination Facility-South (HFEF-S) in 1969 after removal of fuel processing equipment and conversion to fuel examination. The facility was extensively decontaminated from 1977 through 1980 and remained an examination facility until 1990, when it was renamed the Fuel

Table 1. Sitewide Issues

ISSUE	PRIMARY CONCERNS	SITE ACTIVITIES	PROGRESS EVALUATION
1. There are potential hazards associated with the shutdown and defueling of EBR-II in order to place the facility in a safe and stable condition.	These hazards include: • Fuel handling accidents from internal or external initiating events resulting in unplanned criticality • Hydrogen explosion from sodium-water reactions • Operational problems arising from malfunctioning equipment that contribute to increased occupational radiation exposure to the workers.	CH and contractor management are aware of the potential problems associated with the ongoing activities at ANL-W. They are remaining alert for any signs of a deteriorating trend in the area of health and safety and are applying increased management attention to this area.	The defueling of EBR-II is on time, without any significant occurrences. The workforce, in general, has accepted the future down-sizing. Approx-imately 17 people have been laid off to date. **(Updated 10/96)**
2. The six vulnerabilities identified by the Plutonium Working Group are related to the packaging of scrap and/or residue materials shipped to ANL-W from other DOE sites, and to the lack of an up-to-date safety basis for two facilities.	The inadequate packaging of plutonium poses a risk of facility and personnel contamination. The ZPPR and FMF vaults, both of whose hazard category and dose evaluation criteria have changed, do not have an up-to-date safety basis.	ANL-W has prepared and submitted to the Office of Nuclear Energy (NE-2) a corrective action plan to address the vulnerabilities identified by the Plutonium Working Group. Corrective actions identified in the plan are under way.	Corrective actions have been successful. If future funding is provided, the identified vulnerabilities will be corrected. **(Updated 10/96)**

Cycle Facility and was extensively modified to support the IFR Program.

This facility was then renamed the Fuel Conditioning Facility after the March 1994 decision to shut down and decommission EBR-II. A contractor operational readiness review (ORR) was performed in March 1995, and a DOE ORR was performed in May 1995. The contractor ORR identified weaknesses in system labeling, instrument recalibration, and conduct of operations. The DOE ORR findings included a need to validate procedures for technical safety requirement compliance, develop a program for continuing qualification of on-the-job training, confirm compliance with National Environmental Policy Act (NEPA) requirements, and correct deficiencies in the waste management program. The FCF is currently operating.

Building 752, Analytical Laboratory (AL), North Wings (A & B Wings)

The primary mission of the AL is to provide chemical, radiochemical, and physical measurements in support of ANL-W nuclear and environmental programs. The lab processes highly radioactive material and includes six shielded hot cells, decontamination and manipulator repair room, glove boxes, and storage vaults. Analytical processes include inductively coupled plasma-atomic emission spectrometers, atomic absorption spectrometers, ion chromatographs, gamma and alpha spectrometers, time-of-flight mass spectrometers, x-ray diffractometer (x-ray generator), mass spectrometer, laser, and other analytical equipment. The facility includes the Non-Destructive Assay (NDA) Laboratory and the Casting Laboratory.

The AL was placed in operation in the early 1960s. It was extensively modified in 1993 and 1994, including the addition of double high efficiency particulate air (HEPA) filtration of hot cells and removal of perchlorate-contaminated air hoods. Electrical services were upgraded to meet current code. DOE and contractor ORRs were completed in July and August 1995, respectively.

Experimental Breeder Reactor-II

The EBR-II was a uranium-plutonium-fueled, liquid-metal pool-type Category A reactor with a thermal power rating of 62.5 MW with a secondary sodium loop and a steam plant that produced 19 MW of electrical power through a conventional turbine generator. The facility consists of the following buildings: 767, EBR-II Reactor Containment Building; 768, Power Plant; 768B, Water Chemistry Building; 766, Sodium Boiler Plant; 793, Sodium Component Maintenance Shop; 788, EBR-II Maintenance Shop; and 789, EBR-II Engineering Building. EBR-II is currently shut down and being defueled. Defueling includes the removal of 475 fuel and blanket subassemblies and the processing of 90,000 gallons of primary sodium coolant. The process of fuel removal is expected to continue through 1996, followed by processing of the sodium coolant in the Sodium Processing Facility.

EBR-II was placed in operation in 1964. Over the life of the reactor operation, no design inadequacies were identified that will affect its current shutdown status or decommissioning.

Building 785, Hot Fuel Examination Facility (HFEF)

The HFEF is a hot cell complex designed and equipped to examine highly irradiated fuels and materials and was to support the IFR and other liquid metal reactor programs. The facility provides storage for approximately 1,500 individual fuel elements. The facility also has a high bay area that provides waste

characterization of contact-handled transuranic waste in preparation for shipment to the DOE WIPP site. The facility houses the NRAD reactor, which is a 250 kW Training Research Isotope Production General Atomic (TRIGA) nuclear reactor. NRAD is located in a basement subcell. The HFEF hot cell area includes an air atmosphere decontamination cell, an argon atmosphere main cell, decontamination areas, and repair areas for hot cell equipment.

The HFEF was placed in operation in 1975. Major modifications were made in 1975 for handling a large, irradiated, sodium-containing test loop and in 1992 for the addition of the waste characterization area. The facility will be providing mixed waste characterization, repackaging, and container treatment preparation for disposal of waste at WIPP and other DOE facilities in support of the INEL Site Treatment Plan. The facility is well maintained and in excellent physical condition.

Transient Reactor Test Facility (TREAT)

The TREAT is a Zircaloy-clad, graphite-moderated Category B reactor designed primarily for operation in the transient or pulse mode and for destructive testing of prototypic fast reactor highly enriched ceramic type fuel. TREAT can also be used as a large neutron-radiography source. The facility consists of the following buildings: 720, TREAT Reactor Building; 721, TREAT Office Building; 723, TREAT Warehouse; and 724, TREAT Reactor Control Room.

TREAT was placed in operation in 1959. Major modifications and additions were made in 1963, 1972, 1979, and 1982. The only known design deficiency is that dynamic seismic loading criteria were not used in the design of the TREAT reactor or building; however, the design is considered adequate. TREAT was placed in radiologically safe shutdown in 1995.

Neutron Radiography Reactor (NRAD)

The NRAD is a heterogeneous, water-moderated, solid-fueled, tank-type reactor operating at a steady-state power of 250 kW. The reactor is located in the basement of HFEF (Building 785) and uses TRIGA fuel and a standard TRIGA instrument and control system. The NRAD control room is located on the main floor. The reactor room is maintained at a negative pressure with respect to HFEF to control the spread of radioactive particulate.

The NRAD facility provides the basic capability for obtaining neutron radiographs of irradiated and unirradiated fuels and materials under examination at the HFEF and provides irradiation capabilities for other laboratory supported programs. The NRAD was placed in operation in 1977. The facility was modified in 1982 with the addition of the North Radiography Station (NRS), which provides the capability to neutron radiograph irradiated or unirradiated specimens from other facilities without exposing them to the alpha contaminated HFEF main cell.

Zero Power Physics Reactor (ZPPR)

The ZPPR, a Category B reactor, is a split-table-type critical facility and is in nonoperational standby. The ZPPR was designed for simulating the properties of a liquid metal reactor from small space reactors to 1,000 MWe cores, while operating at low power levels (10 to 50 watts) and never exceeding 2,000 watts. The integrated power over life was only 950,000 watt-hours, which is

less than EBR-II produced in 1 minute. Accordingly, radioactivity levels are minimal, allowing contact handling of fuel and structural components. The fuel is essentially unirradiated and contains almost no fission products. The reactor is air cooled, and the core is readily accessible for hand loading of reactor material.

ZPPR consists of the following buildings: 775, Vault-Workroom Equipment Room, used for fuel loading and fuel storage; 776, Reactor Cell, where the reactor is in a defueled standby status; 784, Materials Control Building, used for storage of non-fissile material plates for reactor mockups; 792, Mockup Building; and 774, ZPPR Support Wing, which contains the ZPPR Control Room, a small research reactor (Argonne East Source Reactor) in a permanent shutdown status awaiting D&D and office space. The ZPPR was placed in operation in 1969. During the time it has been in operation, no design inadequacies were identified that will affect its current shutdown status.

Fuel Manufacturing Facility (FMF)

The FMF houses binary (i.e., uranium and zirconium) fuel manufacturing equipment and a vault in which Category I quantities of SNM, including plutonium, are stored. The vault air is continuously monitored for airborne radioactive contamination, including plutonium. The exhaust is HEPA filtered and monitored for alpha and gamma activity.

The FMF was utilized to manufacture and store fuel slugs, elements, and subassemblies. Currently FMF is used to manufacture stainless steel dummy subassemblies for placement in the EBR-II reactor as part of the defueling effort. The fuel manufacturing activities in the FMF did not involve plutonium except for leak testing, bonding and subassembly manufacturing involving sealed elements.

Building 798, Radioactive Liquid Waste Treatment Facility (RLWTF)

The RLWTF is a small two-story, 5000 square foot facility that processes low-level radioactive liquid waste from EBR-II, FCF, HFEF, TREAT, ZPPR, and support facilities. The process is designed to evaporate 60,000 gallons of low-level aqueous radioactive waste annually using a shielded hot air drum evaporator (SHADE). SHADE utilizes heated air (250 F) in an adiabatic saturation process wherein moisture is absorbed by the hot air moving through a cascading spray and over standing water in a drum processor. Facility operations depend on the radioactive liquid waste inventory. The facility is normally unmanned, with the exception of shift routines for recording operating parameters when the facility is operating.

Radioactive Scrap Waste Facility (RSWF)

The RSWF, Building 771, provides interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition. The facility consists of a rectangular array of about 1,200 vertical, carbon-steel-lined storage positions. Each storage position is a cylindrical hole bored into the ground, measuring about 2 feet In diameter and 12 feet in depth. The storage positions are distributed along a row on 6- foot centers and spaced 12 feet apart. A wide variety of radioactive scrap and waste, packaged in a variety of configurations, is stored in about 740 of the storage positions. The RSWF is being upgraded by placing material into new cathodically protected liners.

The RSWF was placed in operation in 1965. The facility upgrade project was initiated in

1989 to replace the carbon steel liners following discovery of three significantly corroded liners in 1988; the liners should have had a design life of 20 to 50 years. It is anticipated that an additional 1,350 liners will be installed to increase the capacity of the facility to support EBR-II shutdown.

RSWF is not normally occupied except during construction, maintenance, or material transfer operations. During these activities, up to approximately ten personnel would be located in the RSWF vicinity.

4.2 FACILITY SUMMARY

Table 2 summarizes key facility characteristics, including status, hazard classification, authorization basis, worst case design basis accident, and principal hazards and vulnerabilities.

5.0 PERFORMANCE MEASURES

A modification to Contract No. W-31-109-ENG-38, dated August 1, 1995, established a system utilizing performance measures and criteria in 17 categories evaluating ANL-W performance. Following are the goals and success indicators for the ES&H and safeguards and security programs that form the basis for the evaluation of ANL-W performance of these programs.

Environmental Management

- **Goal**: Contractor will effectively utilize DOE resources to accomplish restoration and waste management programs.
  Success Indicator: Well established project plans are properly executed.

Safeguards and Security

- **Goal:** The laboratory will conduct safeguards and security operations to ensure effective protection of national security interests, proprietary information, personnel, property, and the general public.
  Success Indicator: An effective safeguards and security program will comply with all applicable Federal, state, and local laws, and all DOE orders applicable to safeguards and security in a cost-effective manner.

Environment, Safety and Health

- **Goal 1:** Reduce uncertainties, prioritize risks, and eliminate threats of our activities to improve environmental quality.
  Success Indicator: Releases are below regulatory limits and Departmental requirements.

- **Goal 2:** Take necessary actions to prevent all serious injuries and all fatalities and to eliminate all worker exposures and environmental releases in excess of established limits.
  Success Indicator 1: Employees freely express their concerns and these concerns are acknowledged and resolved in a timely manner.
  Success Indicator 2: Prevent fatalities, serious injuries, incidents of illness, exposures, and releases (in excess of established limits).

- **Goal 3:** Ensure that there are specific ES&H performance requirements for DOE activities as basis for measuring progress toward continuous improvement.
  Success Indicator 1: Amount of facility wastes decreases over time.
  Success Indicator 2: Environmental reviews of projects/activities improves over time.

Success Indicator 3: Compliance with environmental permit conditions improves over time.

A evaluation of ANL-W by ARG-W using these performance measurements and criteria has been completed, but the results will not be final until February 1997. Additionally, a new modification to the contract has been developed that includes new performance measures and criteria for FY 1997 ANL performance. The latest final appraisal, conducted in FY 1995, contains the combined

Table 2. Facility Summary

FACILITY NAME	STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN BASIS ACCIDENT	PRINCIPAL HAZARDS AND VULNERABILITIES
Fuel Conditioning Facility: Buildings 765 & 709	Operational for fuel storage	Category (Cat) II nuclear facility; Safety Basis - FCF Final Safety Analysis Report (FSAR) 6/9/93 (DCN F0000-0018-AK)	Severe flow reversal in the air cell exhaust system - 50 yr committed effective dose equivalent (CEDE) at site boundary is $1.3x10^{-2}$ mSv.	Fissile and radioactive solids and gases, exposed heavy metals, hazardous metals, hydrogen, argon, sodium
Analytical Laboratory Building 752, North Wings (A & B Wings)	Operational	Cat III nuclear facility; Safety Basis - ANL-W Analytical Laboratory Safety Analysis Report, April 1995, WO660-0055-KW.	Fire in Hot Cell result in < 0.5 mrem CEDE at site boundary.	Fissile material (U), transuranic waste (Pu, Np, Am, U), cadmium, fission and activation products
Experimental Breeder Reactor II: Bldgs. 766-768, 793, 788 & 789	Shut down	Cat I nuclear facility; Safety Basis - EBR-II Hazards Summary Report (HSR), (ANL-5719), issued May 1957 with 28 addenda, the latest revision in 1990	Core meltdown due to high reactivity addition has no offsite consequence due to double containment. (Note: The reactor core is totally defueled.)	Fissile and radioactive solids, sodium, radioactive fission gases, hydrogen, and argon

Hot Fuel Examination Facility: Building 785	Operational	Cat II nuclear facility; Safety Basis - Hot Fuel Examination Facility/North Facility Safety Report, ANL-7959. Requires upgrade with respect to nuclear and hazardous chemical inventories.	Loss of containment barrier combined with loss of coolant to fuel results in 30 rem to critical organ at site boundary. (Note: This accident is not consistent with current uses of the facility.)	Spent fuel and reactor irradiated nuclear material containing plutonium, fission products, sodium, argon, hydrogen
Transient Reactor Test Facility: Buildings 720, 721, 723, and 724	Shut down	Cat II nuclear facility; Safety Basis - FSAR 8/92 (DCN S3942-0001-YT-03)	Reactor reactivity insertion; will not cause core damage or offsite consequence.	Enriched uranium, Zircaloy, Inconel, fission products, sodium, graphite, reflector blocks, lead shield blocks, asbestos
Neutron Radiography Reactor: Building 785	Operational	Cat II nuclear facility; Safety Basis - HFEF Neutron Radiography Facility Reactor Final Safety Analysis Report, 8/77 (DCN W0170-0015-SA-00) Addendum 9/82 (w-31-109-eng-38)	Failure of cladding in a four element cluster during a loss of coolant, resulting in whole body dose at site boundary of 0.003 mrem.	Reactor fuel (enriched uranium and erbium)

Table 2 (cont'd). Facility Summary

FACILITY NAME	STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN BASIS ACCIDENT	PRINCIPAL HAZARDS AND VULNERABILITIES
Zero Power Physics Reactor	Non-operational Standby	Cat II nuclear facility; Safety Basis - Final Safety Analysis Report on the Zero Power Plutonium Reactor (ZPPR) Facility, ANL-7471, 6/72, ZPPR Vault Safety Assessment Document (SAD), 1980	Workroom fire; presents no unacceptable risks to personnel or surrounding facilities.	Fissile material (plutonium and uranium), low-level fission products, and small quantities of actinides in the fuel
Fuel Manufacturing Facility	Operational	Cat II nuclear facility; Safety Basis - Final Safety Analysis Report for the Fuel Manufacturing Facility (ANL-IFR-57), 12/86	Uranium fire inside casting furnace results in insignificant dose at site boundary.	Nuclear fuel elements, uranium, and plutonium
Radioactive Liquid Waste Treatment Facility: Building 798	Operational	Radiological facility per DOE-STD-1027-92; Safety Basis - Safety Analysis Report for the Radioactive Liquid Waste Treatment Facility (W7980-0115-ES)	Spill of contents of tanker results in no significant dose at the site boundary.	Low-level mixed fission product with tritium, Cs-137, and Sr-90, and trace amounts of Co-60, uranium, and other fission products
Radioactive Scrap Waste Facility: Building 771	Operational	Cat II nuclear facility; Safety Basis - Final Safety Analysis Report for the Radioactive Scrap and Waste Facility, 1983, ANL Safety Assessment for Storage of EBR-II fuel (1992), Criticality Hazard Control Statement, FE-CHCS-A18	13 foot drop accident of a waste can; no significant consequence at site boundary.	Fissile material, heavy metal, mixed waste, and fission products

results of ANL-E and ANL-W. Where applicable, ratings were weighted between ANL-W and ANL-E and between the size and complexity of various programs or functions within a singly rated category. The ratings for this appraisal are as follows:

- Institutional Management Performance-Excellent
  - Assigned Goals And Missions- Excellent
  - Institutional Planning-Excellent
  - Staffing And Organization-Excellent

- Programmatic Performance-Excellent
  - Nuclear Energy Programs-Excellent
  - Energy Research Programs- Excellent
  - Science Education and Technical Information-Outstanding
  - Nonproliferation and National Security-Excellent
  - Environmental Restoration and Waste Management-Excellent (ANL-W Good)
  - Fossil Energy-Excellent
  - Energy Efficiency and Renewable Energy-Outstanding

- Operations Support Performance-Excellent
  - Programs and Facilities Management-Excellent
  - Environment, Safety, Health and Quality Assurance-Excellent (At ANL-W Quality Assurance is rated Marginal/Good, Industrial Hygiene is rated excellent, Industrial Safety is rated excellent, Emergency Preparedness is rated good, Fire Protection is rated excellent, Environmental Protection is rated good, Hazardous Waste Management, Mixed Waste Management, and Radioactive Waste Management are rated good, and the EBR-II Nuclear Safety Program is rated excellent.)
  - Safeguards and Security Management-Excellent (At ANL-W Security and Information Services Division, Safeguards and Security Program is rated outstanding, and the Classification Program is rated excellent.)
  - Construction Management-Excellent (At ANL-W the program is considered excellent.)

- Administrative Management-Excellent
  - Procurement Management-Excellent
  - Work-for-Others Management-Excellent
  - Financial Management-Excellent
  - Human Resources Management-Excellent
  - Legal Services-Excellent
  - Intellectual Property Management-Good
  - Technology Transfer Management-Outstanding
  - Laboratory Directed Research and Development-Outstanding
  - Information Resource Management-Excellent
  - Personal Property Management-Good